

APPENDIX R
Pulmonary Disease

APPENDIX R: Pulmonary Disease

Contents

<u>Table</u>		<u>Page</u>
R-1	Unadjusted Analyses of Respiratory Variables by Group (Original Comparisons Only).	R-1
R-2	Adjusted Analyses of Respiratory Variables by Group (Original Comparisons Only).	R-3
R-3	Summary of Group-by-Covariate Interactions for Respiratory Variables (Original Comparisons Only).	R-5
R-4	Cross Tabulation of Bronchitis- (Abnormal, Total) by- Exposure Index Category-by-Age Category-by-Pack-Years for Ranch Hand Officers.	R-9
R-5	Cross Tabulation of Pneumonia- (Abnormal, Total) by- Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Officers	R-10
R-6	Cross Tabulation by Hyperresonance- (Abnormal, Total) by- Exposure Index Category-by-Pack-Year Category for Ranch Hand Officers.	R-11
R-7	Cross Tabulation of Thorax- and Lung- (Abnormal, Total) by-Exposure Index Category for Ranch Hand Officers	R-12
R-8	Cross Tabulation of X Ray- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Officers.	R-13
R-9	Cross Tabulation of Bronchitis- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers	R-14
R-10	Cross Tabulation of Pleurisy- (Abnormal, Total) by- Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers	R-15
R-11	Cross Tabulation of Pneumonia- (Abnormal, Total) by- Exposure Index Category-by-Age Category for Ranch Hand Enlisted Flyers.	R-16
R-12	Cross Tabulation of Hyperresonance- (Abnormal, Total) by- Exposure Index Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers	R-17

APPENDIX R: Pulmonary Disease

Contents (continued)

<u>Table</u>	<u>Page</u>
R-13 Cross Tabulation of Thorax and Lung Abnormalities- (Abnormal, Total) by-Exposure Index Category for Ranch Hand Enlisted Flyers	R-18
R-14 Cross Tabulation of Asthma- (Abnormal, Total) by- Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Groundcrew.	R-19
R-15 Cross Tabulation of Pleurisy- (Abnormal, Total) by- Exposure Index Category-by-Age Category for Ranch Hand Enlisted Groundcrew.	R-20
R-16 Cross Tabulation of Wheezes- (Abnormal, Total) by- Exposure Index Category-by-Age Category for Ranch Hand Enlisted Groundcrew.	R-21
R-17 Cross Tabulation of Wheezes- (Abnormal, Total) by- Exposure Index Category-by-Pack-Year Category for Ranch Hand Enlisted Groundcrew	R-22
R-18 Cross Tabulation of Bronchitis- (Abnormal, Total) by- Exposure Index Category for Ranch Hand Enlisted Groundcrew	R-23

TABLE R-1.

**Unadjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)**

Variable	Statistic	Group				Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison			
		Number	Percent	Number	Percent		
Asthma	n	1,016		954		0.98 (0.64,1.51)	0.92
	Abnormal	44	4.3	42	4.4		
	Normal	972	95.7	912	95.6		
Bronchitis	n	1,015		954		0.91 (0.71,1.19)	0.50
	Abnormal	129	12.7	131	13.7		
	Normal	886	87.3	823	86.3		
Pleurisy	n	1,016		953		0.98 (0.65,1.49)	0.92
	Abnormal	47	4.6	45	4.7		
	Normal	969	95.4	908	95.3		
Pneumonia	n	1,016		953		0.95 (0.76,1.18)	0.64
	Abnormal	195	19.2	191	20.0		
	Normal	821	80.8	762	80.0		
Tuberculosis	n	1,015		954		1.32 (0.43,3.97)	0.64
	Abnormal	7	0.7	5	0.5		
	Normal	1,008	99.3	949	99.5		
Thorax & Lungs	n	1,015		955		1.29 (0.87,1.92)	0.20
	Abnormal	61	6.0	45	4.7		
	Normal	954	94.0	910	95.3		

TABLE R-1. (continued)

Unadjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Statistic	Group				Est. Relative Risk (95% C.I.)	p-Value
		Ranch Hand		Original Comparison			
		Number	Percent	Number	Percent		
Asymmetrical Exp.	n	1,015		955		0.94 (0.16,5.49)	0.95
	Abnormal	2	0.2	2	0.2		
	Normal	1,013	99.8	953	99.8		
Hyperresonance	n	1,015		955		1.01 (0.60,1.69)	0.98
	Abnormal	30	3.0	28	2.9		
	Normal	985	97.0	927	97.1		
Dullness	n	1,015		955		--	0.17
	Abnormal	2	0.2	0	0.0		
	Normal	1,013	99.8	955	100.0		
Wheezes	n	1,015		955		1.42 (0.76,2.67)	0.28
	Abnormal	24	2.4	16	1.7		
	Normal	991	97.6	939	98.3		
Rales	n	1,015		955		1.41 (0.42,4.70)	0.59
	Abnormal	6	0.6	4	0.4		
	Normal	1,009	99.4	951	99.6		
X ray	n	1,012		951		0.83 (0.63,1.10)	0.20
	Abnormal	102	10.1	113	11.9		
	Normal	910	89.9	838	88.1		

TABLE R-2.

Adjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
	Ranch Hand	Original Comparison			
Asthma	1,012	953	****	****	PACKYR (p=0.02) GRP*PACKYR (p=0.03)
Bronchitis	1,011	953	0.91 (0.70,1.18)	0.44	GRP*PACKYR (Borderline: p=0.09)
Pleurisy	1,012	952	****	****	GRP*PACKYR (p=0.0006)
Pneumonia	1,012	952	0.97 (0.77,1.22)	0.74	AGE (p=0.002)
Tuberculosis	1,011	953	1.32 (0.43,3.98)	0.60	GRP*PACKYR (Borderline: p=0.06)
Thorax and Lungs	1,011	954	1.33 (0.88,2.01)	0.14	AGE (p<0.0001) PACKYR (p<0.0001)
Asymmetrical Exp.	1,011	954	0.94 (0.16,5.50)	0.97	AGE*PACKYR (Borderline: p=0.08)
Hyperresonance	1,011	954	1.00 (0.58,1.74)	0.87	AGE (p<0.0001) PACKYR (p<0.0001) GRP*PACKYR (Borderline: p=0.09)

TABLE R-2. (continued)

Adjusted Analyses of Respiratory Variables by Group
(Original Comparisons Only)

Variable	Group		Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks*
	Ranch Hand	Original Comparison			
Dullness	1,011	954	--	--	None
Wheezes	1,011	954	1.43 (0.75,2.76)	0.25	PACKYR (p<0.0006)
Rales	1,011	954	1.42 (0.39,5.18)	0.59	AGE*PACKYR (p=0.04) GRP*AGE (p=0.09)
X Ray	1,008	950	0.86 (0.64,1.16)	0.31	AGE (p<0.0001) PACKYR (p=0.02) GRP*PACKYR (Borderline: p=0.07)

*Abbreviations

PACKYR: lifetime smoking history (pack-years)

GRP: group

TABLE R-3.

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
Asthma	Group-by-Pack-Year	0	n	291		268		4.78 (1.39,15.56)	0.04
			Abnormal	11	3.78	3	1.12		
			Normal	280	96.22	265	98.88		
		>0-10	n	284		280		1.33 (0.63,2.83)	0.46
			Abnormal	16	5.63	12	4.29		
			Normal	268	94.37	268	95.71		
		>10	n	437		405		0.57 (0.31,1.05)	0.07
			Abnormal	17	3.89	27	6.67		
			Normal	420	96.11	378	93.33		
Bronchitis	Group-by-Pack-Year	0	n	291		268		1.46 (0.86,2.48)	0.16
			Abnormal	38	13.06	25	9.33		
			Normal	253	86.94	243	90.67		
		>0-10	n	284		280		0.93 (0.58,1.49)	0.75
			Abnormal	38	13.38	40	14.29		
			Normal	246	86.62	240	85.71		
		>10	n	436		405		0.70 (0.47,1.03)	0.07
			Abnormal	52	11.93	66	16.30		
			Normal	384	88.07	339	83.70		

TABLE R-3. (continued)

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
Pleurisy	Group-by-Pack-Year	0	n	291		267		1.48 (0.50,4.37)	0.49
			Abnormal	8	2.75	5	1.87		
			Normal	283	97.25	262	98.13		
		>0-10	n	284		280		4.67 (1.61,13.02)	<0.001
			Abnormal	18	6.34	4	1.43		
			Normal	266	93.66	276	98.57		
		>10	n	437		405		0.52 (0.30,0.90)	0.02
			Abnormal	21	4.81	36	8.89		
			Normal	416	95.19	369	91.11		
Tuberculosis	Group-by-Pack-Year	0	n	290		268		0.31 (0.05,2.34)	0.28
			Abnormal	1	0.34	3	1.12		
			Normal	289	99.66	265	98.88		
		>0-10	n	284		280		—	0.05
			Abnormal	4	1.41	0	0.00		
			Normal	280	98.59	280	100.00		
		>10	n	437		405		0.93 (0.16,5.42)	0.92
			Abnormal	2	0.46	2	0.49		
			Normal	435	99.54	403	99.51		

TABLE R-3. (continued)

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
Hyper-resonance	Group-by-Pack-Year	0	n	291		268		—	0.17
			Abnormal	2	0.69	0	0.00		
			Normal	289	99.31	268	100.00		
		>0-10	n	283		281		2.70 (0.75,9.27)	0.13
			Abnormal	8	2.83	3	1.07		
			Normal	275	97.17	278	98.93		
		>10	n	437		405		0.73 (0.40,1.33)	0.30
			Abnormal	20	4.58	25	6.17		
			Normal	417	95.42	380	93.83		
Rales	Group-by-Age	Born >1942	n	384		341		—	0.35
			Abnormal	1	0.26	0	0.00		
			Normal	383	99.74	341	100.00		
		Born 1922-1942	n	600		577		1.20 (0.34, 4.21)	0.78
			Abnormal	5	0.83	4	0.69		
			Normal	595	99.17	573	99.31		
		Born <1922	n	27		36		—	—
			Abnormal	0	0.00	0	0.00		
			Normal	27	100.00	36	100.00		

TABLE R-3. (continued)

Summary of Group-by-Covariate Interactions for Respiratory Variables
(Original Comparisons Only)

Variable	Interaction	Stratification	Statistic	Group				Adj. Relative Risk (95% C.I.)	p-Value
				Ranch Hand		Original Comparison			
				Number	Percent	Number	Percent		
X Ray	Group-by-Pack-Year	0	n	290		266		0.45 (0.24,0.85)	0.01
			Abnormal	15	5.17	29	10.90		
			Normal	275	94.83	237	89.10		
		>0-10	n	282		281		1.08 (0.62, 1.89)	0.79
			Abnormal	28	9.93	26	9.25		
			Normal	254	90.07	255	90.75		
		>10	n	436		403		0.93 (0.63, 1.37)	0.72
			Abnormal	59	13.53	58	14.39		
			Normal	377	86.47	345	85.61		

OFFICERS

The statistically significant bronchitis-by-exposure-by-age-by-pack-year interaction ($p=0.009$) shown in Table 20-5 is described here in Table R-4.

TABLE R-4.

Cross Tabulation of Bronchitis- (Abnormal, Total) by-Exposure Index
Category-by-Age Category-by-Pack-Year Category for Ranch Hand Officers

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	4	21	19	0	10	0	1	3	33
	Born 1922-1942	3	32	9	7	36	19	8	44	10
	Born <1922	0	3	0	0	3	0	0	0	
>0-10	Born >1942	1	14	7	2	7	29	0	0	
	Born 1922-1942	2	15	13	5	19	26	1	26	4
	Born <1922	0	0		0	3	0	0	1	0
>10	Born >1942	0	3	0	2	4	50	0	4	0
	Born 1922-1942	8	39	21	3	43	7	4	44	9
	Born <1922	0	0		1	5	20	0	1	0

The statistically significant pneumonia-by-exposure-by-age-by-pack-year interaction ($p=0.040$) shown in Table 20-5 is described here in Table R-5.

TABLE R-5.

Cross Tabulation of Pneumonia- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Officers

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	6	21	29	0	10	0	1	3	33
	Born 1922-1942	6	22	19	6	36	17	10	44	23
	Born <1922	0	3	0	1	3	33	0	0	
>0-10	Born >1942	1	14	7	1	7	14	0	0	
	Born 1922-1942	4	15	27	4	19	21	9	26	35
	Born <1922	0	0		0	3	0	1	1	100
>10	Born >1942	0	3	0	1	4	25	0	4	0
	Born 1922-1942	9	39	23	6	43	14	8	44	18
	Born <1922	0	0		1	5	20	0	1	0

R-10

The statistically significant hyperresonance-by-exposure-by-pack-year interaction (p=0.07) seen in Table 20-5 is tabulated in Table R-6.

TABLE R-6.

**Cross Tabulation of Hyperresonance- (Abnormal, Total) by-Exposure Index Category-
by-Pack-Year Category for Ranch Hand Officers**

Pack-Years	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	0	56	0	0	49	0	1	47	2
>0-10	0	29	0	1	29	3	1	27	4
>10	5	42	12	1	52	2	0	49	0

The statistically significant thorax- and lung-by-exposure category interaction ($p=0.05$) shown in Table 20-5 is tabulated in Table R-7.

TABLE R-7.

Cross Tabulation of Thorax and Lung- (Abnormal, Total) by- Exposure Index Category for Ranch Hand Officers

Exposure Index								
Low			Medium			High		
Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
9	127	7	3	130	2	5	123	4

The statistically borderline significant x ray-by-exposure-category-by-age-by-pack-year interaction ($p=0.08$) seen in Table 20-5 is tabulated in Table R-8.

TABLE R-8.

Cross Tabulation of X Ray- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Officers

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	1	21	5	0	10	0	0	3	0
	Born 1922-1942	3	32	9	1	36	3	2	44	5
	Born <1922	0	3	0	0	3	0	0	0	
>0-10	Born >1942	0	14	0	0	6	0	0	0	
	Born 1922-1942	3	15	20	3	19	16	2	26	8
	Born <1922	0	0		1	3	33	0	1	0
>10	Born >1942	0	3	0	0	4	0	0	4	0
	Born 1922-1942	7	39	18	7	43	16	2	44	5
	Born <1922	0	0		1	5	20	1	1	100

ENLISTED FLYERS

The statistically significant bronchitis-by-exposure-by-age-by-pack-year interaction ($p=0.005$) seen in Table 20-6 is tabulated in Table R-9.

TABLE R-9.

Cross Tabulation of Bronchitis- (Abnormal, Total) by-Exposure Index
Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	2	3	67	0	3	0	0	3	0
	Born ≤1942	0	6	0	0	6	0	1	11	9
>0-10	Born >1942	1	4	25	1	6	17	2	2	100
	Born ≤1942	1	13	8	1	9	11	0	7	0
>10	Born >1942	0	2	0	0	7	0	0	2	0
	Born ≤1942	3	26	12	6	32	19	3	31	10

The statistically borderline significant pleurisy-by-exposure-by-age-by-pack-year interaction (p=0.08) shown in Table 20-6 is tabulated in Table R-10.

TABLE R-10.

Cross Tabulation of Pleurisy- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	0	3	0	0	3	0	0	3	0
	Born ≤1942	0	6	0	0	6	0	0	11	0
>0-10	Born >1942	1	4	25	0	6	0	1	2	50
	Born ≤1942	1	13	8	1	9	11	0	7	0
>10	Born >1942	1	2	50	0	7	0	0	2	0
	Born ≤1942	1	26	4	1	32	3	2	32	6

The statistically borderline significant pneumonia-by-exposure-by-age interaction ($p=0.08$) shown in Table 20-6 is tabulated in Table R-11.

TABLE R-11.

**Cross Tabulation of Pneumonia- (Abnormal, Total) -by-Exposure Index
Category-by-Age Category for Ranch Hand Enlisted Flyers**

Age	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
Born >1942	4	9	44	2	16	13	0	7	0
Born ≤1942	10	45	22	10	47	21	13	50	26

The statistically borderline significant hyperresonance-by-exposure-by-pack-year category interaction ($p=0.08$) shown in Table 20-6 is tabulated in Table R-12.

TABLE R-12.

Cross Tabulation of Hyperresonance- (Abnormal, Total) by-Exposure Index
Category-by-Pack-Year Category for Ranch Hand Enlisted Flyers

Pack-Years	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	0	9	0	0	9	0	0	14	0
>0-10	0	17	0	2	15	13	0	9	0
>10	3	28	11	4	39	10	0	34	0

The statistically significant ($p=0.04$) thorax and lung-by-exposure interaction shown in Table 20-6 is tabulated in Table R-13.

TABLE R-13.

**Cross Tabulation of Thorax and Lung Abnormalities- (Abnormal, Total)
by-Exposure Index Category for Ranch Hand Enlisted Flyers**

Exposure Index								
Low			Medium			High		
Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
7	54	13	10	63	16	2	57	4

ENLISTED GROUND

The statistically significant asthma-by-exposure-by-age-by-pack-year interaction ($p=0.02$) shown in Table 20-7 is tabulated in Table R-14.

TABLE R-14.

Cross Tabulation of Asthma- (Abnormal, Total) by-Exposure Index Category-by-Age Category-by-Pack-Year Category for Ranch Hand Enlisted Groundcrew

Pack-Years	Age	Exposure Index								
		Low			Medium			High		
		Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	Born >1942	1	24	4	1	35	3	1	15	7
	Born 1922-1942	0	18	0	0	6	0	0	9	0
	Born <1922	0	0		0	0		0	0	
>0-10	Born >1942	0	37	0	2	47	4	4	36	11
	Born 1922-1942	1	16	16	1	7	14	0	13	0
	Born <1922	0	0		0	0		0	1	0
>10	Born >1942	0	22	0	4	46	9	0	25	0
	Born 1922-1942	4	33	12	0	21	0	2	37	5
	Born <1922	0	3	0	0	1	0	1	5	20

The statistically significant pleurisy-by-exposure-by-age interaction ($p=0.03$) shown in Table 20-7 is tabulated in Table R-15.

TABLE R-15.

Cross Tabulation of Pleurisy-(Abnormal, Total) by-Exposure Index Category-by-Age Category for Ranch Hand Enlisted Groundcrew

Age	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
Born >1942	5	83	6	5	128	4	0	76	0
Born 1922-1942	7	67	10	0	34	0	5	59	8
Born <1922	0	3	0	0	1	0	0	6	0

The statistically significant wheeze-by-exposure-by-age interaction ($p=0.009$) shown in Table 20-7 is tabulated in Table R-16.

TABLE R-16.

Cross Tabulation of Wheezes- (Abnormal, Total) by-Exposure Index Category-by-Age Category for Ranch Hand Enlisted Groundcrew

Age	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
Born >1942	2	83	2	1	127	1	3	76	4
Born 1922-1942	1	67	1	3	34	9	2	59	3
Born <1922	0	3	0	0	1	0	0	6	0

The statistically significant wheeze-by-exposure-by-pack-year interaction ($p=0.02$) shown in Table 20-7 is tabulated in Table R-17.

TABLE R-17.

Cross Tabulation of Wheezes- (Abnormal, Total) by-Exposure Index Category-by-Pack-Year Category for Ranch Hand Enlisted Groundcrew

Pack-Years	Exposure Index								
	Low			Medium			High		
	Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
0	0	42	0	3	41	0	0	24	0
>0-10	2	53	4	3	53	6	1	50	2
>10	1	58	2	1	68	1	4	67	6

The statistically borderline significant bronchitis-by-exposure category interaction ($p=0.08$) shown in Table 20-7 is tabulated in Table R-18.

TABLE R-18.

**Cross Tabulation of Bronchitis- (Abnormal, Total) by-Exposure Index
Category for Ranch Hand Enlisted Groundcrew**

Exposure Index								
Low			Medium			High		
Abnormal	Total	Percent	Abnormal	Total	Percent	Abnormal	Total	Percent
25	153	16	19	163	12	11	141	8